

Application No. 10/058,284

Art Unit 1742

March 8, 2004

Reply to Office Action of October 8, 2003

REMARKS

Applicants respectfully request the Examiner to reconsider the present application in view of the foregoing amendments to the claims.

Claims 1-8 are pending in the present application. Claims 2, 4, 6 and 8 have been amended. No new matter has been added by way of these amendments, since these amendments are obviously editorial in nature (i.e., claim ends with a period instead of a comma) and are not narrowing in scope (i.e., no issues are raised in the Office Action pertaining to these amendments). The amendment changing "A" to "The" in claims 2, 4, 6 and 8 is also clearly a non-narrowing amendment. Thus, Applicants reserve the right to pursue any equivalent feature of the claims.

The amendments to the Abstract and the present specification are also obviously editorial in nature as well. No new matter has been added.

Based upon the above considerations, entry of the present amendment is respectfully requested.

In view of the following remarks, Applicants respectfully request that the Examiner withdraw all rejections and allow the currently pending claims.

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Oath/Declaration

The Office Action indicates that the Oath or Declaration is defective. Applicants enclose herewith a new Oath or Declaration ("COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT AND DESIGN APPLICATIONS") signed by all the inventors, wherein the boxes corresponding to the foreign priority has been checked. Acknowledgement and consideration of this Oath/Declaration are respectfully requested.

Double Patenting

Claims 1-8 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-8 of co-pending Application No. 09/931,406; claims 1-3 and 6-7 of co-pending Application No. 10/193,576; and claims 1-2 and 5-8 of co-pending Application No. 10/189,043. Applicants respectfully traverse.

The present invention is patentably distinct for the following reasons. Applicants note that the rejection appears to be a combination of the cited applications (and not in the alternative). Applicants respectfully submit that the '576 and '043 application provide a copper-alloy foil having some improved properties. However, the '576 application sets forth that " ... the copper alloy foil having a surface exhibiting no roughening plating process ... , good wettability with a varnish containing polyamic acid" in claim 1. This is one distinction

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already. Also, in the '043 application, the following is claimed: " ... the copper alloy foil having a surface exhibiting no artificial roughening ... adhesive containing an epoxy resin bonding the copper foil to a resin substrate ... " (see claim 1). Thus, given the claims and disclosure of the co-pending applications, the product (and the method of making the product) of the present invention is patentably distinct from these other applications. Thus, reconsideration and withdrawal of the provisional rejection(s) are respectfully requested.

In the alternative, Applicants respectfully request that the Examiner hold this provisional rejection in abeyance until this or the co-pending application actually issues as a patent. Also, if certain conditions are met, Applicants respectfully request that the Examiner withdraw the rejection in the present application and maintain the rejection in one of the other applications. See *M.P.E.P.* § 804, page 800-19, right column, first full paragraph.

Issues Under 35 U.S.C. § 103(a)

Claims 1-8 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Chen et al. '662 (U.S. Patent No. 5,681,662), JP '936 (JP 10324936), JP '040 (JP 11264040), Tomioka '499 (U.S. Patent No. 6,093,499). Also, claims 1-4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tomioka '362 (U.S. Patent No. 6,602,362 B2).

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Applicants respectfully traverse, and reconsideration and withdrawal of all rejections are respectfully requested.

The Present Invention and Its Advantages

Generally speaking, copper sheets of printed circuit boards should have sufficient heat resistance and other properties (e.g., foil is used as the conducting material). Other sheets have been proposed to improve upon certain properties, but such conventional sheets have insufficient etching, signal transmission, strength, roughness, etc. (as explained by Applicants in their specification at page 2, line 13 to page 3, line 21).

On the other hand, the present invention has achieved improved electric conductivity, strength, roughness and adherence with polyimide resin. The present invention relates to a copper-alloy foil to be used for a laminate sheet of a printed circuit board. Specifically, the present invention is directed to a copper alloy foil, which contains, by mass percentage, one or more of the additive elements of from 0.01 to 2.0% of Cr and from 0.01 to 1.0% of Zr. The balance is essentially Cu and unavoidable impurities. The copper alloy foil of the present invention has 600N/mm² or more of tensile strength, 50% ICAS or more of electric conductivity, and 2 μ m or less of the surface roughness in terms of the ten-point average surface-roughness (Rz) and 8.0 N/cm or

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more of 180° peel strength when directly bonded with a polyimide film without roughening plating.

Also, the unexpected results of the present invention have been experimentally confirmed. In this regard, Applicants respectfully refer the Examiner to Table 2 at page 13 of the present specification. Please see page 10, lines 31+ for a summary of this data shown in the Table. As can be seen, Table 2 shows that the overall characteristics of the presently claimed copper alloy foils have unexpectedly improved hot rolling workability, surface roughness, electric conductivity, impedance, tensile strength and/or peel strength. A description of these properties is at page 9, line 32 to page 10, line 26.

In contrast, the cited references (and combinations thereof) fail to disclose all features and advantages of the present invention.

Distinctions over the Combination of Chen '662, JP '936, JP '040 and Tomioka '499

The Office Action refers Applicants to Col. 3, lines 10-31 and Figure 7 of the cited primary Chen '662 reference. However, Applicants respectfully submit that Chen '662 further describes in the same column 3 that:

To improve adhesion to the polymer substrate, the foil is treated with a adhesion enhancing compound, such as electrolytically deposited copper dendrites, ... Other adhesion enhancing processes include ... a chromium phosphate coating ..." (see lines 32-42).

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Thus, there is no disclosure of a copper foil having 8.0 N/cm or more of 180° peel strength when directly bonded with a polyimide film without roughening plating (roughening plating refers to copper particles electrolytically precipitated on the copper foil; see the present specification at page 2, lines 14-17) as instantly claimed. The Office Action even acknowledges that the cited references fail to disclose roughening plating (see page 4, last two lines). Thus, Applicants respectfully submit that these rejections have been overcome since a *prima facie* case of obviousness requires disclosure of all claimed features. See *In re Vaeck*, 947 F.2d, 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991); see also *In re Kotzab*, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000). Accordingly, reconsideration and withdrawal of these rejections are respectfully requested.

The Office Action states that since the cited references do not disclose roughening plating, this lack of disclosure suggests the foil surface in the references is smooth and that this claimed feature has been met. Applicants respectfully traverse this reasoning and conclusion.

None of the cited references discloses all features as instantly claimed. There is no disclosure in Chen '662, JP '936, JP '040 or Tomioka '499 of a copper foil having 2 μm or less of the surface roughness in terms of the ten-point average surface-roughness (Rz) as instantly claimed (see claim 1 as presented). In fact, the cited Chen

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'662 reference does not disclose this feature for a reason. As Applicants explain in the present specification, electrolytically polishing the surface of a copper foil leads to a surface roughness (2 μm or less of Rz) (see page 7, lines 16-22). The presently claimed surface roughness of 2 μm or less in terms of Rz can also be made on wrought copper foils by means of decreasing the surface roughness of a work roll (see page 7, lines 20, 21 and 23-25). Thus, given this disclosure, polishing is not the same as the electrolytical deposition of dendrites and nodules as disclosed in Chen '662 (see Col. 3, lines 32-39 of this reference). In other words, the surface is polished to smoothen the surface but is then roughened by the electrolytical deposition in Chen '662. Thus, none of the cited references, including the primary Chen '662 reference, discloses a surface roughness as instantly claimed. Further, no reasoning or evidence has been provided by the Examiner that any of these references disclose this claimed feature of the present invention.

The lack of disclosure in each of the cited references is in addition to how there is no disclosure in the cited references of a copper foil having 8.0 N/cm or more of 180° peel strength when directly bonded with a polyimide film without roughening plating as instantly claimed. Thus, Applicants respectfully submit that a *prima facie* case of obviousness has not been established (i.e., the requirement of disclosure of all claimed features has not been met), and

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reconsideration and withdrawal of these rejections are respectfully requested.

Applicants also submit that the requisite motivation and reasonable expectation of success are also not met. See *In re Vaeck*, 947 F.2d, 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). For instance, one of ordinary skill in the art, upon reading the cited Chen '662 reference, would not refer to the JP '040 reference since JP '040 is directed to a different alloy. JP '040 is directed to an alloy having Ni and Si (see paragraph [0014]), and not the alloy such as that disclosed in Chen '662. Thus, any combination of, for example, JP '040 with Chen '662, is improper. Further, such a combination would destroy the intended function of Chen '662, since incorporating the Ni-Si alloy of JP '040 into the Chen '662 alloy would lead to an alloy having Ni and Si in much higher amounts than allowed by Chen '662 (see Col. 3, lines 22-24). In this regard, Applicants respectfully submit that if a proposal for modifying the cited reference in an effort to attain the claimed invention causes the reference to become inoperable or destroys its intended function, then the requisite motivation to make the modification would not have existed. *In re Gordon*, 221 USPQ 1125 (Fed. Cir. 1984) (Federal Circuit stating that modifying the French apparatus as the Board suggested would render the apparatus inoperable for its intended purpose); *In re Fritch*, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992); see also *In re Ratti*, 123 USPQ 349, 352 (CCPA 1959). That is the case

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here because the present invention would destroy the intended function of the Chen '662 reference. Thus, Applicants respectfully submit that the other requirements for a *prima facie* case of obviousness have not been satisfied and these rejections have been overcome. Withdrawal of these rejections are respectfully requested.

Distinctions over the Modification of Tomioka '362

Tomioka '362 fails to disclose the peeling strength and the surface roughness as instantly claimed (see the Office Action at page 4, paragraph 11). Thus, under *In re Vaeck*, Applicants respectfully submit that this rejection has been overcome since a *prima facie* case of obviousness requires disclosure of all claimed features. Further, such claimed features, including the roughness feature, are not within the disclosure of Tomioka '362 simply because this reference is silent about roughening plating. Also, Tomioka '362 does not disclose the claimed roughness feature because the cited reference fails to recognize the advantages of such a feature (as achieved by the present invention). There is no disclosure to suggest to one of ordinary skill in the art, upon reading Tomioka '362, to modify this reference to achieve the formulations as instantly claimed. Thus, Applicants respectfully submit that a *prima facie* case of obviousness has not been established. Reconsideration and withdrawal of this rejection are respectfully requested.

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Unexpected Results

Applicants respectfully submit that the present invention has achieved unexpected results, which rebuts any asserted *prima facie* case of obviousness (whether based on Chen '662, JP '936, JP '040, Tomioka '499, or Tomioka '362 or any combination thereof).

As mentioned, the presently claimed copper alloy foils have unexpectedly better hot rolling workability, surface roughness, electric conductivity, impedance, tensile strength and/or peel strength (see Table 2 of the present invention). Thus, Applicants respectfully request consideration of these unexpected results, and withdrawal of all rejections (*i.e.*, citing the modification of Tomioka '362) cited under the provisions of 35 U.S.C. § 103(a).

Conclusion

A full and complete response has been made to all issues as cited in the Office Action. Applicants have taken substantial steps in efforts to advance prosecution of the present application. Thus, Applicants respectfully request that a timely Notice of Allowance issue for the present case.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Eugene T. Perez (Reg. No. 48,501) at the telephone number of the

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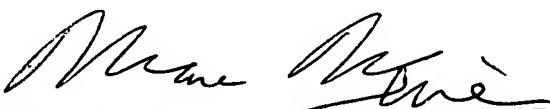
undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Pursuant to 37 C.F.R. § 1.17 and 1.136(a), Applicants respectfully petition for a two (2) month extension of time for filing a response in connection with the present application. The required fee of \$420.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASCH & BIRCH, LLP

By 
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Attachments: Abstract of the Disclosure
Combined Declaration and Power and Attorney

(Rev. 02/12/2004)

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ABSTRACT

A copper alloy foil to be used in a printed board having a polyimide substrate is provided. The copper foil is not subjected to roughening plating and has hence fine surface roughness and can be directly bonded with the polyimide substrate. The copper alloy contains (a) one or more of the additive elements of from 0.01 to 2.0% of Cr and from 0.01 to 1.0% of Zr, or (b) from 1.0 to 4.8% of Ni and from 0.2 to 1.4% of Si. The surface roughness in terms of the ten-point average surface-roughness (Rz) is 2 μm or less, the 180°peeling strength is 8.0N/cm or more. The alloy (a) has 600N/mm² or more of tensile strength, and 50%ICAS or more of electric conductivity. The alloy (b) has 650N/mm² or more of tensile strength, and 50%ICAS or more of electric conductivity.